**AP Calculus - Group Assignment**

**Optimizing the Volume of a Box**

*Directions:* Complete this assignment with the people in your group. At the end of the activity I will collect one copy from each group.

*The Problem:* Start with an 8.5 x 11 inch piece of paper. Imagine that you were to cut squares of equal size from each of the four corners. You could now fold up the sides to form a box. Your objective is to analyze how volume of the box varies based on the size of the cut out squares.

1.) Write an equation for the volume of any rectangular prism.

2.) Using the piece of paper that I handed out to each group, cut out and construct your own model of this scenario. This visual may help you to answer some of the following questions.

3.) Write an equation for the volume of this type of box with respect to *x*, where *x* is the length of the sides of the cut out squares.

4.) What is the interval of possible x values (the domain) that make sense in the context of this problem? Explain your reasoning.

5.) Graph the equation for volume that you came up with in #3 on a graphing calculator. Indicate the viewing window that you chose draw a quick sketch below.

Xmin: Sketch:

Xmax:

Ymin:

Ymax:

6.) Is there an x value that maximizes the volume of the box? If so, what is it and what volume does it produce? If not, explain why not.

7.) Is there an x value that minimizes the volume of the box? If so, what is it and what volume does it produce? If not, explain why not.

8.) If there’s time, repeat the process above but consider the exterior surface area of the box instead of volume. You may complete this part on another piece of paper.